

Development a Set of Instructional Learning Based Realistic Mathematics Education and Local Wisdom

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Abstract

Mathematics is a subject that considered difficult for students even teachers had difficulty to teach it. This is because of the process of learning mathematics has been using a mechanistic approach. It begins with introducing the abstract conceptual in formal mathematics. Even though mathematics is always relate with human activity. Therefore, in teaching and learning process, teacher should use a real-world context so that children know and understand the significance of mathematics in their lives. Realistic Mathematics Education is introduced to the context of their daily life, so it may be associated with the children experience of mathematics. Therefore, it takes planning and learning resources to accommodate the child's experience. This study was designed to develop a prototype of the device that accommodates the child's everyday learning with numbers and mathematical concepts in particular are taught in elementary geometry. By accommodating the child's everyday phenomena, it can develop the values of local wisdom that can be generated through a learning device which is based on the concept of realistic mathematics learning. In the process, it has been found that the initial prototype validated to receive input for improvement. The analysis shows the need for improvement in several concepts, including using of words. It is important that is obtained is the need for adjustment device developed by a curriculum 2013. Based on the results of the validation will be revised to get a prototype which further empirically tested to determine its validity.

Keywords: realistic mathematics education, the value of local wisdom.

1. Introduction

In 2013 curriculum, learning mathematics emphasized linkage between mathematics content and real life activity. This cause of human activity always have in contact with the phenomena related to the mathematical concept it's means that although the object of mathematics is abstract, but in learning process we can use a realistic approach, so it is expected that students not feel that mathematics is a difficult material.

According to the NCTM [1] students should learn mathematics by understanding and construct their knowledge through experience and prior knowledge. This shows that teachers need to design learning activities that can support them to learn mathematics. Learning mathematics in principle based on the idea that understanding concept is very important in learn mathematics. Learning mathematics is not only requires arithmetic but also thinking and reasoning process then they will get a new ideas. However, studying mathematics can provide opportunities for students to practice their thinking process, evaluating the results and relating what they was thinking so that they can develop the ability of reasoning. To showing the ability of critical thinking and reasoning, the design of instructional must give students opportunity for develop their thinking and reasoning process. Teachers can design instructional material that can provide students to bring the values of local wisdom in each region as a source of learning process. The values of local wisdom are a value around the neighborhood of students who are integrated in the learning.

Maluku as an island province has a many of local wisdom. It can use as a context for learning mathematics. In this study, we use some of the local wisdom such are; Sago plate we said “*Sagu Lempeng*”, or “*embal love*” (a traditional food made by sago and cassava), the slugs (we said as “*kulibia*”) and traditional games “*Gici-gici*” and “*Boi*”. According to [2] there are some of local wisdom values such as:

- (1) Values Fraternity and Kinship (we said ‘*Pela- Gandong*’) containing brotherhood and kinship relations,
- (2) Principles of Consensus Meeting in the customary system of government and indigenous people mainly “*Saniri Negeri*” and “*Jou*” or “*Soa*”. All decision of indigenous people in *Soa* and a head of *Saniri* must be in consensus.
- (3) The principle of Appreciation Humanitarian Values and life like eating in “*Lesu*”, or “*Tapalang*”, eating with Taloi, eating “*sagu salempeng*”, which is intended to be in life should still appreciate and respect human values
- (4) The Principles of Respect and Recognition to Others, such as: Tabia is congratulations day, Upu term meaning the Father, while the term ina means she directed at women, as a form of respect and appreciation [3].

The principles and values is getting washed out because the younger generation is now less concerned with those values because not spoken or taught on a regular basis to be the norm in a socially meaningful. In addition, Sutarno [4] describes three kinds of culture-based learning models, namely: (1) Model-based learning culture through traditional games and folk songs. (2) Model-based learning culture through folklore (3) model-based learning culture through the use of traditional tools. Therefore, in this study will be designed a model of development that is designed in the PMR-based learning by integrating indigenous Maluku cultural values of Maluku through traditional games or the use of terms in the traditional leadership. Using the learning resources are expected to participate in the increasing sense of nationalism learners so that they better recognize cultural values developed in the community. During the process of students experiencing a stage where students can learn and adopt some acquired skills that will affect the attitudes, behaviors, and their thinking process.

The learning process linking mathematics with real-world context is characteristic of Realistic Mathematics Education (RME), which was developed in 1971 by Freudental. According Freudental in Gravemeijer [5], mathematics must be related with real life and mathematics as a human activity. It means that mathematics should be close to the children and relevant to real life. Mathematics as a human activity means that with a guide from a adult make a children get opportunity to find ideas and concepts of mathematics. The concept of reality in RME is not limited to the reality experienced of the children, but it can be anything that ever existed in their mind. This approach oriented on the principles and character of Indonesian Realistic Mathematics Education (PMRI) which starts from something that are "real" for students, emphasizing mathematical skills process, discussing, collaborating, and arguing with classmates until they find by themselves the meaning of learning mathematic.

The learning process will be begins with contextual problem that real with students real life and the things that existed in their mind. By using this approach in learning process, we can find some value of learners that can be implanted. There are cooperation, responsibility and discipline. It is visible when students are given the

opportunity to contribute in solving mathematical problems through discussion activities and presenting the problem [6].

Value or character development of students can occur when instructional are designed to develop it. Therefore, this study developed a prototype that consists of teaching materials, as well as teaching materials, student worksheet and lesson plan to accommodate the values of local wisdom. We expected that a set of learning material can development of character value of students. The set of teaching material will be generated to accommodate indigenous endangered Maluku, namely: Class will be designed as a custom country and formed groups called “*soa*”, as a table we called “*Tapalang*”, and for greeting we call “*Tabia*”, greeting for female teachers is *Ina* and *Upu* for male teachers. The Chairman calls “*upu latu*”. The group can also be named according to the name of the country in the Maluku so there will be a group that has a relationship in “*gandong*” or “*pela*”. This kinship will be used in class discussion to give each other feedback. The group that showed the value of the character will be rewarded with cards containing the character values.

Designing the activity in this study refers to the five characteristics of RME [7]. These five characteristics are:

- (1) The use of context as an exploration of the context phenomenological and as a starting point from which a desired mathematical concept may appear,
- (2) Using the model and symbol for the progressive matematisasi to lead student representative models from the informal level to the level of formal.
- (3) Using the construction and production of the students' major contribution to the learning process of construction is expected to come from the students themselves that lead students from informal ways towards a more formal,
- (4) the existence of interactivity between students and teachers and students with students and
- (5) Integration with other learning topics.

Thus the research question is: how the process and results of the development of realistic mathematical learning model based on local wisdom in developing the character values of the children?

2. Method

This research is using the model development proposed by Thiagarajan, Semmel and Semmel [8], as known as the Four-D Model (Model 4-D). It consists of four phase namely Define, Design, Develop and Desimination . 4-D model is chosen because it is suitable to develop a systematic and learning tools, but in this study the researchers conducted the modification of the model of 4-D. Development this research is the development of learning materials composed of Instructional Materials (fractions, geometry and integers), worksheet, and Instrument valid, practical, and effective. The research was conducted in the SD Negeri 2 in Amahusu Village sub-district of Nusaniwe, and SD Negeri 2 Waai. It regency of Centre of Maluku with sub-district of Salahutu. Whereas respondents with a free trial are students in fourth grade in SD Negeri 1Seilale in Latuhalat Village in district of Nusaniwe. The stages of development which are:

- (1) Definition Stage (Define). This stage begins by analyzing SKL, KI and KD in the curriculum 2013 and then studied the network theme involving mathematical concepts and procedures. In addition, students analyze a character and culture or environment play and learning environment of students. This stage of the process ends with the determination of the material culture associated with the child's environment, which establishes a traditional game that is often used children and cultural terms that can be used as an example in learning, for example, for grouping students, “*soa* used to demonstrate indigenous groups.
- (2) Stage Design (Design) drafting the initial (first draft) relating to the flat to get up the learning material, fractions and place value concepts. This learning tool includes lesson plans (RP), teaching materials, student worksheet (LKS) and achievement test (THB). In forming teaching materials adapted to the model of the student book and teacher preparation that elicits steps scientific approach to learning, but attention Maluku local knowledge, such as teaching materials compiled begins with contextual problems that students experienced daily including traditional games “*gici-gici*”, the introduction of special food and culture of Maluku selling fruits in Maluku.
- (3) Development Stage (Develop) that aims to produce a draft of a learning device in the sense that both meet the criteria of validity. There are three steps in this phase of the validation experts, readability test and limited testing. Assessment conducted on devices that are compiled and used as the basis of the revised draft in the next revision. Validation tools focused on the content, format, language and illustrations as well as the suitability of the learning fractions, numbers and geometry.
- (4) The phase of dissemination activities were carried out in the form of the publication process and results of development through seminars and publish article in journal.

Data were analyzed descriptively to answer the purpose of the research. The results will be shows that how the development of a set of instructional teaching material geometry and numbers using realistic mathematics education approach suitable with criteria for validity, practicality, and effectiveness. However, this study has done in analysis stage the teaching and learning process because it is still necessary to test to see the effects and results of sets of instructional. Validity analysis is intended to determine the extent of the learning that has been created to meet the validity criteria based assessment of expert review. They are assigned using expert validation sheet. The results form the basis of expert validation and consideration in revising. The evaluation criteria for eligibility or validity of the set of instructional design is fulfill some of criteria such as; (1) the results of the expert review show a set of instructional is fit for use with a maximum less revision, (2) the results of the trial showed that: effective student activities, positive student response, the teacher's ability to manage learning good, and (3) achievement test: the range of validity from enough to high, high reliability and all test items are sensitive. For the analysis of practicality, it was conducted to determine whether the devices are designed to fulfill the learning criterion is determined based on the practicality of the feasibility study. The effectiveness analysis conducted to determine whether the devices are designed to satisfy the learning

component of the effectiveness criteria, namely: (1) student activities, (2) management learning, (3) student responses, (4) the response of teachers, and (5) achievement test.

3. Results and Discussion.

Based on the research designs and methods used, the data collect in this study is assessment results of the first prototype and the results of the second prototype revision. Analysis of expert review related to the contents, format, language and illustrations as well as the suitability of the learning fractions, numbers and geometry. There are some suggestions from expert review for prototype 1 such as:

a. Contents.

Contents or materials are developed to suitable with the theme and sub-theme in the curriculum 2013. It needs attention to the presentation of curriculum in accordance with the hierarchy of mathematical concepts, such as the introduction of the basic concepts necessary to link the realities in children real life. The material is suitable circuitry developed for grade 3, prepare syllabus material has not been compiled taught as needed for analyze KI and KD and creates a network of appropriate themes and subthemes.

b. Format.

Lesson plan format are used by according to the characteristics of Realistic Mathematics Education (RME), with the need to show the steps which appear scientific approach. We are adding a column to show the appearance of the activity of reading, reasoning, exploring, associate, analyze and communicate. It is not visible step mathematics realistic learning and its relationship with scientific approach.

c. Language

The language that used in teaching material is easy to understand children. Still there are some terms and culture that do not appear in the writing of the steps in the lesson plans, worksheets and materials.

d. Illustration.

The illustrations used should be made more attractive again, should be extended with the relevant party's illustration topic and narrative is used. In every step of learning needs to be made more interesting.

Based on the analysis of two expert reviews, it can be seen that the preparation of prototype I have not fit for use, and the need for revisions. The results of the revision are carried out as follows:

1. Based on a review of the syllabus and material fractions in elementary school, it was determined that the materials are developed is topic of fraction in grade 4 as a replaces from the grade 3. The approach for understanding the concept in first prototype are associate with typical food of Maluku is "emba love" and sago and also with the culture of selling of Maluku people.
2. We must addition the learning steps of realistic mathematics education approach in relation to lesson plan and scientific approach base on curriculum 2013. Worksheet must be looks interesting so the children will enjoy in learning activity.
3. Pay attention in grammatical writing and improving the terms of language.
4. Illustration must be made in accordance with the concept of presenting the curriculum in 2013, for example, the appearance of words such as "Do you know..." Or "Let's find out", etc...

There are several findings in this study with a limited test involving 4th grade at SD Negeri Silale, SD Negeri 2 Tulehu and SD Negeri 1 Hatu. One of each in the sub-district of Nusaniwe, Leihitu and Leihitu West. The result are students are not accustomed to using the term such as “*Soa*”, *Tabea*, so it seems almost rigid in the pronunciation and not accustomed to using of them. Not all students consume food typical of the region, so it is necessary to introduce some examples of typical foods like “*kayabu*”, “*gayang*”, and “*bagea*”, which is a contextual proble around children. In relation to the implementation of lesson plans, it is necessary for set timing so the design not take a side route. For the teaching materials is not visible space for activities at home, so that students only learn the material presented in the instructional materials. At the beginning of the test the teacher is still sometimes difficult to change habits that have been taught, so that sometimes the learning process is come out from the plan.

4. Closing

The successful of learning process is depending on determining the availability of learning and its implementation. Therefore the development needs to defining stages (Define), design (design), development (develop) and the spread (disseminate). In this study the process of development is still in need of revision to produce a valid learning tool, practical and reliable, especially with attention the changes of curriculum 2013 especially using subject as a topic not using theme of each class and topic. The weaknesses in the first prototype must be revising. The revision process made on the set of instructional through a limited test. Then, we expected to obtain valid and reliable realistic mathematics instructional.

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